

Claims:

1. An ink jet printer apparatus for printing on a receiver medium comprising:

at least one nozzle connected to a supply of ink;

a controller, responsive to a first signal related to media type, for generating a second signal for determining for said nozzle an ink drop volume to be deposited at each of plural pixel locations on the receiver medium by that nozzle including a decision of no drop to be deposited at some of the pixel locations, at least some of the second signals determining at least three different drop volumes including a no drop decision;

an actuator associated with said nozzle and responsive to said second signal for controlling said nozzle to deposit at a respective pixel location a respective drop volume to be deposited in accordance with said second signal so that the printer prints at least three different drop volumes including no drops at different pixel locations on the medium.

2. The ink jet printer apparatus of claim 1 and wherein a carrier supports the at least one nozzle for movement relative to the receiver medium so that the nozzle is moved across the receiver medium with plural recording passes to record an image swath of pixels on a reference raster during each such recording pass and the controller is adapted to provide second signals to the actuators regarding drop volumes to be deposited on the reference raster for that image swath during each respective recording pass of the plural recording passes.

3. The ink jet printer apparatus of claim 2 and wherein the controller includes a pass table that stores drop volume related values, and in response to a multitone pixel value signal generates a third signal related to the drop volume related value.

4. The ink jet printer apparatus of claim 3 and wherein the third signal represents an index value associated with a respective drop volume.

5. The ink jet printer apparatus of claim 4 and wherein the controller includes a print masking table that stores decision values for determining whether or not a drop is to be deposited by each nozzle at a respective pixel location on the reference raster during a respective recording pass and the controller is responsive to the third signal and to a respective decision value in the print masking table to generate the second signal for controlling the actuator to determine drop volume to be deposited at the pixel location by the nozzle during the respective recording pass.

6. The ink jet printer apparatus of claim 5 and wherein the apparatus includes a communication channel for receiving inputs for a job of a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for processing the job and the controller, in response to such job inputs, generates a fourth signal representing a first code value from a table of plural number of selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job and the apparatus further includes either the same communication channel or a separate communication channel for receiving inputs of a fifth signal representing said selected one of plural recording resolutions, a selected one of plural bits per pixel, a selected number of band passes to be used to print the image swath on the reference raster and optionally a selected number of directions in which printing is to occur and in response to the fourth and fifth signals generates table values for the pass table.

7. The ink jet printer of claim 6 and wherein the controller includes a drop volume table that is responsive to application of a decision based on a decision value in the print masking table for generating the second signals representing an ink drop volume for recording on the receiver medium in a respective pass.

8. The ink jet printer of claim 7 and wherein the controller includes a pass table of drop volume related values for printing on the reference raster and a

different pass table of drop volume related values for printing on a shifted raster, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

9. The ink jet printer of claim 8 and wherein values in the shifted raster pass table and reference raster pass tables are adapted to be changed in response to changes in the fourth signals representing a change of one of recording resolution or media type.

10. The ink jet printer of claim 2 and wherein the controller includes a pass table of drop volume related values for printing on the reference raster and a different pass table of drop volume related values for printing on a shifted raster, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction, and wherein during a pass the controller controls the nozzles to print pixels either on the reference raster or the shifted raster but not both during any particular pass.

11. The ink jet printer of claim 10 and wherein values in the reference raster pass table and shifted raster pass table are adapted to be changed in response to a change in media type.

12. The ink jet printer of claim 11 and wherein a value in the reference raster pass table and a value in the shifted raster pass table are output from the respective tables in response to the same multitone pixel value signal, the

multitone pixel value signal being optionally repeated to be effective for operation for both tables.

13. The ink jet printer of claim 12 and wherein the values in the reference raster pass table and the shifted raster pass table are index values, and a drop volume table is provided that stores drop volume producing signal values and, for a particular pass on each of the reference raster and the shifted raster, the index values from the reference raster pass table and shifted raster pass table are used, for at least certain pixel locations on each of the reference raster and the shifted raster, to generate outputs from the drop volume table for actuation by the actuators during the respective pass on the reference raster and on the shifted raster.

14. The ink jet printer of claim 1 and wherein there are plural of said nozzles and the controller includes a table of drop volume related values for printing on the reference raster and a different table of drop volume related values for printing on a shifted raster, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the first direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the first direction, and wherein, during a pass movement of the nozzles relative to the medium in a predetermined direction, the controller controls the nozzles to print pixels either on the reference raster or the shifted raster but not both during any particular pass.

15. A method of operating an ink jet printer apparatus for printing on a receiver medium, the method comprising:

providing a print head having at least one nozzle;
generating a signal related to media type being recorded by the receiver medium;

recording image data of an image by depositing at least three different ink drop volumes including no ink drop on the receiver medium at different pixel locations to form dots of different dot size or dot density at different pixel locations; and

wherein in recording image data of a same multitone image data value on different media, in response to the signal related to media type, the drop volumes deposited on one medium by the nozzle are different than the drop volumes deposited on another medium by the nozzle.

16. The method of claim 15 and wherein the at least one nozzle is moved relative to the receiver medium with plural recording passes to record an image swath of pixels on a reference raster during each recording pass and ink drop volumes deposited at selected locations during each pass are in response to media type.

17. The method of claim 16 and wherein ink drop volumes during each pass are controlled in response to table values which are adjusted with media type.

18. The method of claim 17 and wherein job input signals are received corresponding to a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for processing the job and in response to the job inputs a code value is generated from a plurality of selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job, the code value being used to identify a table of values associated with drop volumes used for printing.

19. The method of claim 18 and wherein a selected one of plural recording resolutions, a selected one of plural bits per pixel, and a selected number of band passes to print the image swath on the reference raster and optionally a selected number of directions in which printing is to occur are used in

combination with the code value to identify a table of values associated with drop volumes used for printing.

20. The method of claim 19 and wherein the table of values associated with drop volumes represents indices, and indices are used by a pass table and in response to a multitone signal representing a pixel to be printed at a predetermined location an index value is output by the pass table.

21. The method of claim 20 and wherein the index value is input to a print masking table to determine whether or not the pixel to be printed at the predetermined location is printed during a predetermined pass.

22. The method of claim 21 and in response to the determination that the pixel is to be printed at that predetermined location during that predetermined pass the index value is input to a drop volume lookup table for developing a signal to enable the nozzle to print an ink drop, at a corresponding drop volume to the index value input to the drop volume lookup table, at the pixel location during that predetermined pass.

23. The method of claim 16 and wherein the at least one nozzle is moved relative to the receiver medium with plural recording passes to record an image swath of pixels on a shifted raster, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

24. The method according to claim 23 and wherein the shifted raster pass table of indices is provided and in response to a multitone signal representing a

pixel to be printed at a predetermined location on the shifted raster an index value is output by the shifted raster pass table.

25. The method of claim 24 and wherein the index value from the shifted raster pass table is input to a print masking table to determine whether or not the pixel to be printed at the predetermined location on the shifted raster is printed during a predetermined pass.

26. The method of claim 25 and in response to the determination that the pixel is to be printed at that predetermined location during that predetermined pass on the shifted raster the index value is input to a drop volume lookup table for developing a signal to enable the nozzle to print an ink drop at the pixel location during that predetermined pass.

27. The method of claim 16 and wherein the at least one nozzle is moved relative to the receiver medium with plural recording passes to record an image swath of pixels on a shifted raster, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

28. The method of claim 27 and wherein ink drop volumes during each pass on the reference raster and each pass on the shifted raster are controlled in response to table values which are adjusted with media type.

29. The method of claim 28 and wherein job input signals are received corresponding to a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for processing the job and in response to the job inputs a code value is generated from a plurality of

selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job, the code value being used to identify a table of values associated with drop volumes used for printing.

30. The method of claim 15 and wherein the at least one nozzle is moved relative to the receiver medium to record an image swath of pixels on a shifted raster and on a separate pass, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

31. The method of claim 30 and wherein ink drop volumes deposited on the reference raster and deposited on the shifted raster are controlled in response to table values which are adjusted with media type.

32. The method of claim 31 and wherein a multitone signal representing a pixel to be printed determines output of a table value associated with the reference raster and a table value associated with the shifted raster.

33. The method of claim 15 and wherein job input signals are received corresponding to a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for processing the job and in response to the job inputs a code value is generated from a plurality of selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job, the code value

being used to identify a table of values associated with drop volumes used for printing.

34. The method of claim 33 and wherein the at least one nozzle is moved relative to the receiver medium to record an image swath of pixels on a reference raster and a shifted raster during separate passes, and wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in the pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

35. The method of claim 34 and wherein an image swath of pixels is recorded on the reference raster in two passes using print masking to reduce coalescence of adjacent ink drops on the reference raster.

36. A method of processing image data for an ink jet print head, the method comprising:

- receiving multitone image data representing at least three different gradation tone values including zero density or background;

- receiving information relative to media type upon which ink drops are to be deposited;

- in response to the information relative to media type, adjusting a parameter associated with drop volumes so that for different media types a gradation tone value will be printed differently.

37. The method of claim 36 and wherein for the gradation tone value and one media type a signal is generated for depositing an ink drop on a reference raster but not for depositing an ink drop on a shifted raster and for the gradation tone value and a second media type a signal is generated for depositing an ink drop on a reference raster and a signal is generated for depositing a supplementary

ink drop on an adjacent location on a shifted raster, wherein the shifted raster represents, for a predetermined printing resolution, a grid pattern of possible pixel locations on the recording medium that are shifted relative to each pixel location on the reference raster by an amount less than the spacing between adjacent pixel locations on the reference raster in a pass direction and by an amount less than the spacing between adjacent pixel locations on the reference raster in a transverse direction to the pass direction.

38. The method of claim 37 and wherein job input signals are provided corresponding to a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for processing the job and in response to the job inputs a code value is generated from a plurality of selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job, the code value being used to identify a table of values associated with drop volumes used for printing.

39. The method of claim 38 and wherein a selected one of plural recording resolutions, a selected one of plural bits per pixel, and a selected number of band passes to print an image swath on the reference raster and optionally a selected number of directions in which printing is to occur are used in combination with the code value to identify a table of values associated with drop volumes used for printing.

40. The method of claim 39 and wherein the table of values associated with drop volumes represents indices, and indices are used by a pass table and in response to a multitone signal representing a pixel to be printed at a predetermined location an index value is output by the pass table.

41. A method of processing image data for a print job to be printed by an ink jet print head, the method comprising:

receiving inputs for the job of a selected one of plural recording resolutions, a selected one of plural media types and optionally a selected one of plural inks for use in printing the job;

in response to the inputs generating a code value from a table of a plural number of selectable code values, the number of selectable code values being substantially less than the number of combinations of plural recording resolutions, plural media types and optionally plural inks possible for selection for the job.

42. The method of claim 41 and wherein the code value represents a coverage factor equivalent for plural combinations in the set plural recording resolutions, plural media types and optionally plural inks possible for use in printing the job.